

LIQUID APPLICATOR VALVE

BACKGROUND OF THE INVENTION

Field of the Invention

A liquid valve body for attachment with the neck of a liquid container has liquid
5 dispensed by inverting the container and pressing on an implement, such as one having tines,
that in turn presses on an elastic closure cap having a valve seal that is lifted off of its seat on a
stopper to pass liquid therethrough.

Description of Related Art

The dispensing of fluids by application of pressure against the coating or writing
10 implement is common in the art. This application is a modification of the "Liquid Applicator
Valve" of Gilbert Schwartzman, U.S. Patent No. 6,402,413, issued 11 June 2002,
incorporated herein by reference. G. Schwartzman, U.S. Patent No. 3,129,452, teaches a
pressure opened valve held closed using a compressible material under the coating surface
with the coating surface held in place over the compressible material by placement of the outer
15 perimeter of the coating surface within a surrounding groove and crimping or swagging it in
the groove to clamp it there. Waters et al, U.S. Patent No. 5,120,148, issued 9 June 1992,
teaches a resilient cap that biases a valve against a valve seat. The resilient cap is provided
with a rib around its lower end, that is used to hold the cap in position, and dispensing holes in
its upper end used as a dauber.

SUMMARY OF THE INVENTION

The invention is to an instrument for the application of a fluid for coating or treating by dispensing fluid from a container. The instrument consists of a stopper and an elastic closure cap. The elastic closure cap is one integral piece that essentially consists of a diaphragm and an elastic dome, that acts as a spring, and a valve neck with a sealing rib that engages with a valve seat on the stopper to form a fluid flow control.

The elastic closure cap is attached to, or inserted into, an annular recess in the stopper so that a force is created on the dome area of the elastic closure cap pressing the sealing rib against the stopper valve seat precluding fluid flow through the instrument or pressing the sealing rib away from the valve seat. Fluid is dispensed by pressing against the nib or other implement that in turn presses against the valve neck and lifts the sealing rib off of the valve seat to provide a flow path between the fluid container and the nib. The implement can include tines that rub or scrape and coat a surface.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of the applicator valve of the invention. Fig. 2 is a sectional view of the application valve taken along the section line 2-2 of Fig. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention is to an applicator **40**. The major components shown in Fig. 1 are a stopper **48** and an elastic closure cap **47**, that attach to a fluid container (not shown). The stopper **48** fits within or over a container neck to act as a seal against unwanted fluid discharge and as a controlled passage for fluid discharge. The stopper **48** supports the elastic closure cap **47** and the closure cap secures an implement, such as on having tines **51**, in place. Pressure on the tines and/or diaphragm **49** portion of the elastic closure cap opens a fluid flow passage so that the fluid can pass from the fluid container to the elastic closure cap **47** and through the slot openings **44** to an object.

10 The individual components and interrelationships are best seen in Fig. 2. The stopper **48** second or lower end **41**, as shown, is designed to fit within the upper neck of a fluid container by inserting the stopper lower neck **41** into the container neck or opening. The stopper second or lower end could be designed to fit over a container neck or both over and within the container neck if desired.

15 The first upper end **65** of the stopper **48** has a raised upwardly extending interior section **53** formed about a central opening **54**. The lower wall of the stopper interior section **53** is sloped inwardly and upwardly forming a tapered valve seat **57** that ends or terminates in

the central opening **54** fluid passage. The upper first end of the interior section **53** is provided with a raised circular limit rib **42**. The outer wall of the interior section forms a sealing rim **43** that terminates at its lower end in a recessed base **63**. Extending essentially parallel to and outwardly from the sealing rim **43** is an outer circumferential side wall **62** of the stopper that terminates, slightly above the circular limit rib **42**, with an inwardly extending side wall **50**.

5 The elastic closure cap **47** has an integral central diaphragm area **49** extending outwardly into a dome-shaped intermediate area section **52** with a skirt area **64** extending downwardly from the lower radial extremity of the intermediate dome area **52** forming a first end. A flexible or resilient implement, such as coating or scraping tines **51**, extend upwardly 10 from the diaphragm upper area **49** extremity. The dome area is provided with slot openings **44** inwardly of and adjacent to the intermediate area **52**. About the center of the diaphragm area, a valve neck **45** extends downwardly from the diaphragm. At the lower end of the valve neck, a circular sealing lip **46** extends outwardly. The valve neck **45** is preferably hollow to reduce rigidity. The inner lower first end of the skirt area **64** is provided with a sealing 15 enlargement or rib **55**. The sealing rib enables a firm securement of the closure cap on the stopper so that the tines can be used to rub a surface with a coating material and/or to remove incidental material on a surface.

The elastic closure cap **47** can be made from an elastic resilient stretchable material such as a plastic or natural or synthetic rubber material having the necessary elasticity or

resilience to flex or extend for insertion into or over the stopper 48, and to deform or stretch enough for sealing and valve operation, and to hold the implement. The material must be compatible with the fluid used. The tines can be strong enough to scrape a surface if desired.

5 The diaphragm slot opening 44 performs two functions, it weakens the resistance to deformation of the central area of the diaphragm 49 and it provides a passage for the fluid moving past the sealing lip 46 when the valve neck is pressed inwardly.

The components are assembled by placing the stopper 48 neck 41 within a fluid container. The elastic closure cap 47 skirt 64 has a slightly larger diameter than that of the circumferential side wall 61 inside diameter, and the valve neck 45 has a smaller outside 10 diameter than that of the diameter of the fluid passage 54 in the valve seat 57. The outside diameter of the sealing lip 46 is larger than that of the fluid passage 54. The skirt area 64 and sealing rib 55 can be pressed into the circumferential recess, between the side wall 62 and sealing rim 43 as the sealing lip 46 is pressed through the fluid passage in the tapered valve seat 57 until the elastic cap sealing rib 55 base or first end approaches the recess base 63 15 leaving a small void area 59. Pressing the elastic closure cap skirt 64 into the circumferential recess between the circumferential side wall 61 and sealing rim 43 places the dome area 49 under the compression, tending to press or deform the attached diaphragm and dome primarily upwardly. This upward movement of the dome area places an upward tension force on the 20 central area of the diaphragm 49 and valve neck 45, attached to the diaphragm, and on the sealing lip 46 on the valve neck. This deformation or upward force causes a spring-like force

on the valve neck 45 and sealing lip 46, preventing fluid flow by engaging the sealing lip with the stopper valve seat 57.

During non-use, the fluid within a fluid container is sealed therein by the sealing lip 46 of the elastic closure cap 47 pressing against the tapered valve seat 57. The fluid within the 5 container can be dispensed to the implement by holding the container in the inverted position and pressing the implement against a surface or object. Upward and inward pressure on the inverted implement is transferred to the diaphragm area 49 where it acts against the now downward force created by the dome area 52 of the elastic cap 47. Overcoming the diaphragm resistance results in an inward movement of the valve neck 45 and sealing lip 46. 10 The inward movement of the sealing lip causes it to separate from the tapered valve seat and to open a passage from the fluid container to the implement base or back through the fluid passage 54 and slot openings 44. The limit rib 42 of the stopper functions both as a guide for fluid flow, during fluid discharge, and to a degree as a limit stop for inward movement of the valve neck 45 and sealing lip 46. The limit rib 42 helps prevent the slots 44 of the elastic 15 closure cap from being blocked by the upper end of the interior section 53 during pressure application against the times 51 and diaphragm 49. The limit rib can have its height and position, with respect to the opening or passage, adjusted depending on the rigidity and elasticity of the elastic closure cap, the flow path desired, the viscosity of the liquid or fluid being used, the valve opening desired, etc.

The lower end of the skirt 64 is offset forming a shoulder 66 and an annular recess inwardly of the sealing rib 55. The upper outer end of the sealing rib 55 extends upwardly into an annular projection 68 forming an outer recess 69.

The times 51 can be used as both liquid applicator and rubbing member. They can
5 scrape a surface or a coating on a surface to be acted on in concert with a material dispensed onto the surface. It is preferred to firmly secure the elastic closure cap to the stopper. To do this, in addition to the resilient frictional forces that can be used between the stopper and elastic closure cap skirt, the stopper upper circumferential projection 61 is crimped or swagged inwardly and downwardly 50 into the outer recess 69 in the sealing rib 55. The
10 terminal end 56 of the stopper upper end 50 is positioned within the outer recess 69. This results in the sealing rib 55 being thicker than the space remaining between the stopper extended interior sections and stopper first upper end 50. The terminal end 56 of the circumferential projection can be pressed against the closure skirt 64 with some indentation into it, and can press the dome inwardly reducing the outer circumference of the elastic cap at
15 that area of the skirt 64.

It is believed that the construction, operation and advantages of this invention will be apparent to those skilled in the art. It is to be understood that the present disclosure is illustrative only and that changes, variations, substitutions, modifications and equivalents will

be readily apparent to one skilled in the art and that such may be made without departing from the spirit of the invention as defined by the following claims.